Appendix A. Electrical Specifications

Recommended Operating Conditions

PARAMETER †		TEST CONDITIONS	MIN	NOM	MAX	UNIT
DC Power Input						
V_{DD}	Supply voltage		4.75	5	5.25	V
I_{DD}	Supply current	V_{DD}=5V, I_O=0 all outputs			250	mA
Digital Inputs from MC-BUS						
V_{IH}	High-level input voltage	All inputs	2		V_{DD}+0.3	V
V_{IL}	Low-level input voltage	All inputs	–0.3		0.8	
I_I	Input current(V_I=GND to V_{DD}) ‡	$\overline{\text{PORESET}}$,QEP1, QEP2 IOPC6/CAP3	–800		10	µA
		IPOC0/ADCSOC	–1200		1200	
		All other input pins	–1200		10	
Analogue Inputs from MC-BUS						
V_{IA}	Analogue inputs range	V_{DD} = 5V	–0.3	0 …5	5.3	V
I_{IA}	Analog inputs current §	V_{IA} = GND to V_{DD}	–10		1200	µA
Digital Outputs to MC-BUS						
I_{OH}	High-level output current, V_{OH} = 2.4 V	$\overline{\text{PORESET}}$			0.01	mA
		IOPA0, IOPA1, IOPA2, IOPA3			–17	
		All other output pins			–23	
I_{OL}	Low-level output current, V_{OL} = 0.6 V	$\overline{\text{PORESET}}$, IOPC2			5	mA
		IOPA0, IOPA1, IOPA2, IOPA3			7	
		All other output pins			13	
V_{OH}	High-level output voltage	V_{DD} = 4.75V, I_{OH} = MAX	2.4			V
V_{OL}	Low-level output voltage	I_{OL} = MAX			0.6	V
System Environment						
T_A	Operating ambient temperature		0		50	°C

† All voltage values are with respect to GND.

‡ All MC-Bus digital pins have on-board 4.7KΩ pull-up resistor to V_{DD} , except $\overline{\text{PORESET}}$, IOPC0, QEPA, QEPB, IOPC6/CAP3. See Appendices B and C for detailed pin description.

§ All MC-Bus analog inputs have on-board 4.7KΩ pull-down resistor to GND. See Appendices B and C for detailed pin description.

Appendix B. MSK240 Connectors

J1 – MC-Bus 1

Pin	Signal	Description	Pin	Signal	Description
1	n.c.	not connected	2	n.c.	not connected
3	PWM1	O/HiZ –T1	4	PWM2	O/HiZ –T1
5	PWM3	O/HiZ –T1	6	PWM4	O/HiZ –T1
7	PWM5	O/HiZ –T1	8	PWM6	O/HiZ –T1
9	CMP7 / IOPB0	I/O/HiZ –T1	10	CMP8 / IOPB1	I/O –T1
11	CMP9 / IOPB2	I/O –T1	12	T1CMP / IOPB3	I/O –T1
13	T2CMP / IOPB4	I/O –T1	14	T3CMP / IOPB5	I/O –T1
15	TMRDIR / IOPB6	I/O –T1	16	TMRCLK / IOPB7	I/O –T1
17	QEP1 / IOPC4	I/O –T2	18	QEP2 / IOPC5	I/O –T2
19	CAP3 / IOPC6	I/O –T2	20	CAP4 / IOPC7	I/O –T1
21	PDPINT	I –T1	22	XINT2 / IO	I/O –T1
23	SCIRXD / IO	I/O –T3	24	SCITXD / IO	I/O –T4
25	$+5V_{DC}$	+5V Supply	26	DGND	Ground
27	DGND	Ground	28	DGND	Ground
29	DGND	Ground	30	VrefLO	Analog Ground
31	ADCIN5	Anlg. I –T5	32	ADCIN13	linked to GND
33	ADCIN6	Anlg. I –T5	34	ADCIN14	Anlg. I –T5
35	ADCIN7	Anlg. I –T5	36	ADCIN15	Anlg. I –T5

J2 – MC-Bus 2

Pin	Signal	Description	Pin	Signal	Description
1	ADCIN2	Anlg. I –T5	2	ADCIN10	Anlg. I –T5
3	ADCIN3	Anlg. I –T5	4	ADCIN11	Anlg. I –T5
5	ADCIN4	Anlg. I 0 –T5	6	ADCIN12	Anlg. I –T5
7	VrefLO	Analog Ground	8	VrefHI	+5V Anlg. Ref. O
9	DGND	Ground	10	DGND	Ground
11	IOPA0	I/O –T1	12	IOPA3	I/O –T1
13	IOPA1	I/O –T1	14	IOPA2	I/O –T1
15	DGND	Ground	16	DGND	Ground
17	RX	I –T6	18	TX	O –T7
19	n.c.	not connected	20	n.c.	not connected
21	$+5V_{DC}$	+5V Supply	22	$+5V_{DC}$	+5V Supply
23	PORESET	I/O –T8	24	n.c.	reserved
25	n.c.	not connected	26	n.c.	not connected
27	SPISIMO / IO	O –T9	28	SPISOMI / IO	I/O –T10
29	SPICLK / IO	O –T9	30	SPISTE / IO	I/O –T9
31	ADCSOC / IOPC0	I/O –T11	32	CLKOUT / IOPC1	O –T12
33	XF / IOPC2	O –T13	34	BIO / IOPC3	O –T12

Pin	Signal	Description	Pin	Signal	Description
35	XINT3 / IO	I –T1	36	NMI	I –T1

Legend: I – input, O – output, HiZ – High-Z, Anlg. – Analog, T1÷T13 – Connection Types (see Appendix C)

J3 – Extension Bus 1

Pin	Signal	Description	Pin	Signal	Description
1	D0	Bi-directional Data Bus	2	D8	Bi-directional Data Bus
3	D1	Bi-directional Data Bus	4	D9	Bi-directional Data Bus
5	D2	Bi-directional Data Bus	6	D10	Bi-directional Data Bus
7	D3	Bi-directional Data Bus	8	D11	Bi-directional Data Bus
9	D4	Bi-directional Data Bus	10	D12	Bi-directional Data Bus
11	D5	Bi-directional Data Bus	12	D13	Bi-directional Data Bus
13	D6	Bi-directional Data Bus	14	D14	Bi-directional Data Bus
15	D7	Bi-directional Data Bus	16	D15	Bi-directional Data Bus
17	DS	Data Space Select	18	$\overline{PS}$	Program Space Select
19	$\overline{IS}$	I/O Space Select	20	---	- not connected -
21	$\overline{STRB}$	Strobe	22	$\overline{WE}$	Write Enable
23	R/$\overline{W}$	Write Strobe	24	W/$\overline{R}$	Read Strobe

J4 – Extension Bus 2

Pin	Signal	Description	Pin	Signal	Description
1	A0	Address Bus	2	A8	Address Bus
3	A1	Address Bus	4	A9	Address Bus
5	A2	Address Bus	6	A10	Address Bus
7	A3	Address Bus	8	A11	Address Bus
9	A4	Address Bus	10	A12	Address Bus
11	A5	Address Bus	12	A13	Address Bus
13	A6	Address Bus	14	A14	Address Bus
15	A7	Address Bus	16	A15	Address Bus
17	RDY	Ready	18	$\overline{RS}$	Reset
19	$\overline{COMMINT}$	Communication Interrupt	20	---	not connected
21	$+5V_{DC}$	+5V Supply	22	$\overline{EN_PS}$	Program Space Enable
23	CLKOUT/IO#13	20MHz Clock Output	24	GND	Ground

J5 - RS-232 Serial Connector

Pin	Signal	Description	Pin	Signal	Description
1	---	not connected	2	TXD	Transmit data
3	RxD	Receive data	4	---	not connected
5	GND	Ground	6	---	not connected
7	---	not connected	8	---	not connected
9	---	not connected	-		

J6 - $5V_{DC}$ Power Supply Connector

Pin	Signal

MSK240 Jumpers

Jumper	Position	Description

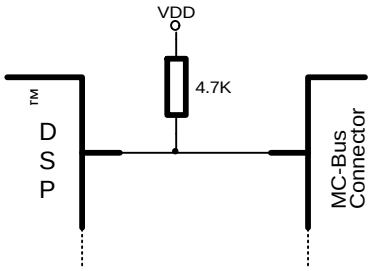
1	$5V_{DC}$ power supply plus (+)
2	$5V_{DC}$ power supply minus (–)

JP1	1-2	Monitor mode
	2-3	User mode (run from 1000h)
JP2	ON	Reset
	OFF	Normal operation

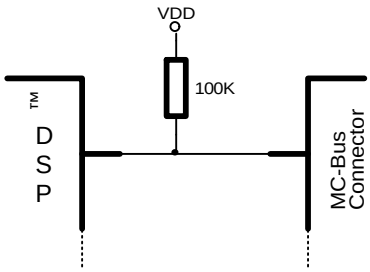
Appendix C. MC-Bus Connection Types

T1: Connected to DSP pin with the same name using a pull-up resistor of 4.7KΩ to +5V_{DC}.

T2: Connected to DSP pin with the same name using a pull-up resistor of 100KΩ to +5V_{DC}.



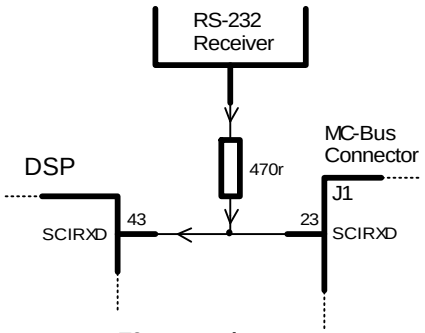
T1 connection type



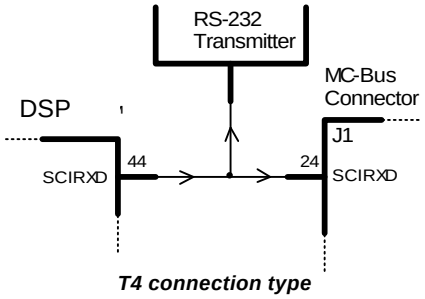
T2 connection type

T3: Connected to the DSP SCIRXD pin. The on-board RS-232 receiver output also drives SCIRXD through a 470Ω series resistor. If MC-bus SCIRXD is connected to an external device capable to drive a 470Ω load, this can override the on-board RS-232 receiver.

T4: Connected to the DSP SCITXD pin. The DSP SCITXD output also drives the on-board RS-232 transmitter.



T3 connection type

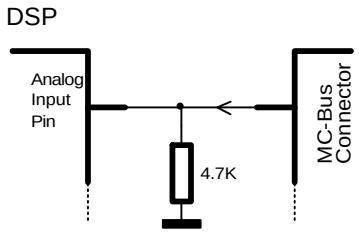


T4 connection type

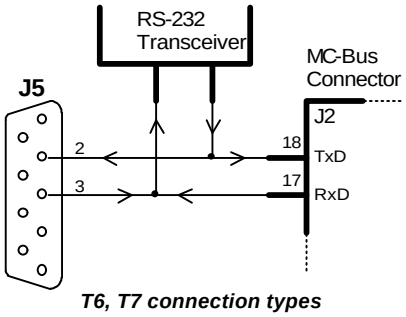
T5: Connected to DSP pin with the same name using a pull-down resistor of 4.7KΩ to ground.

T6: RS-232 input, coming from J5 connector. Goes to the on-board RS-232 receiver. If serial link is done directly through the MC-Bus, remove serial cable from J5, to avoid signal contentions

T7: RS-232 output generated by the on-board RS-232 transmitter. Goes also to J5 connector. If serial link is done directly through the MC-Bus, remove serial cable from J5 to avoid excessive loading of the on-board RS-232 transmitter.



T5 connection type



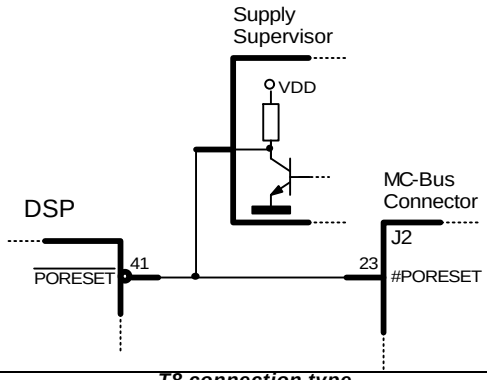
T6, T7 connection types

T8: The MC-Bus $\overline{\text{PORESET}}$ is an open-collector signal, which drives the $\overline{\text{PORESET}}$ pin of the DSP. The MC-Bus $\overline{\text{PORESET}}$ is tied to an on-board supply supervisory device, which pulls low this signal for 200mS when the $+5V_{DC}$ supply goes out of regulation (outside range 4.75V ÷ 5.25V). An external device can use this pin either as an active-low output (to initialise any external device when the DSP is reset) or as an active-low input (shunt to ground to generate a reset). See the recommended operating conditions for details about current loading.

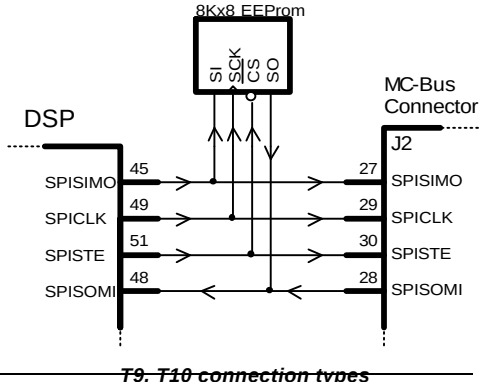
CAUTION !

DO NOT use standard push-pull logic to drive this signal! Use open-collector outputs instead.

T9: Connected to the DSP outputs with the same name. These signals feed also the on-board E^2ROM memory. If an external device is also connected to the SPI bus, the SPISTE signal must be used as an active-high strobe, since the E^2ROM memory is selected when SPISTE is low.



T8 connection type

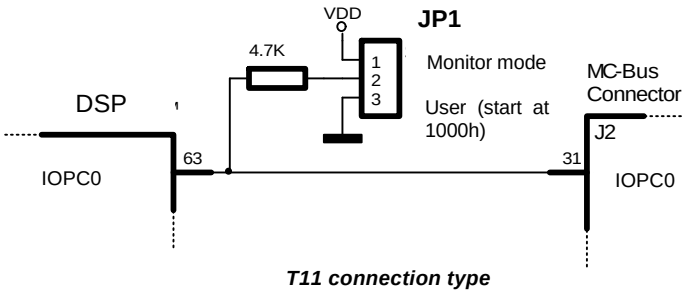


T9, T10 connection types

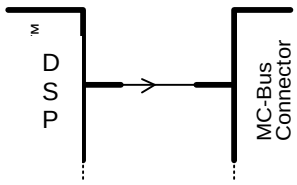
T10: Connected to the DSP input SPISOMI and to the data output of the on-board E^2PROM. This line can be shared with an external SPI device, like a resolver-to-digital converter. Signal contention is managed through SPISTE signal that selects the on-board E^2ROM when low.

T11: Connected to the DSP pin IOPC0 and also to jumper JP1. The connection to JP1 is done through a 4.7KΩ series resistor used function of the jumper position as a pull-up or a pull-down resistor. An external device can drive the MC-Bus signal to override the jumper setting.

T12: Connected directly to the DSP outputs with the same name



T11 connection type



T12 connection type

T13: Connected to DSP output IOPC2 / XF. This signal is apllied also to the on-board green LED1. The led lights when IOPC2 / XF is low. Note that this output has a reduced fan-out, as specified in the recommended operating conditions.

Appendix D. Serial Cable RS-232 Specifications

The MSK240 board uses a Sub-D 9-pin female connector for RS-232 serial communication with a PC. Use a straight-through serial cable having a Sub-D 9 male connector on the MSK240 side and a Sub-D 9 female connector on the PC side. If your PC connector type is Sub-D 25 add a 9-to-25 adapter or use a serial cable with a Sub-D 25 female connector on the PC side.

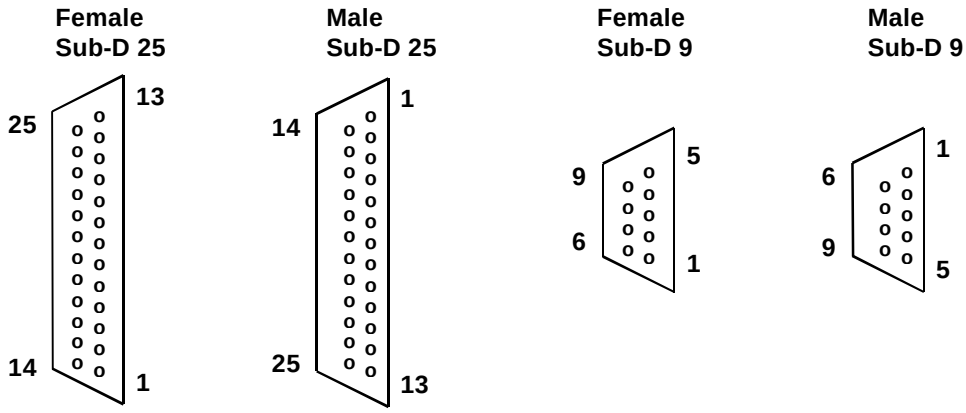


Figure D.1. *Pinout for Sub-D 9 and Sub-D 25 serial connectors (top view)*

Table D.1. *Signal assignment for Sub-D 9 and Sub-D 25 serial communication connectors*

Signal Name	Pin Assignments	
	Sub-D 25	Sub-D 9
Protective ground	1	
Transmit data	2	3
Receive data	3	2
Request to send	4	7
Clear to send	5	8
Data set ready	6	6
Signal ground	7	5
Carrier detect	8	1
Data terminal ready	20	4
Ring indicator	22	9

If you plan to make your own RS-232 cable Figure D.1 and Table D.1 present the pinout and signals assignment for Sub-D 9 and Sub-D 25 connectors. A minimal serial cable must have 3 wires, and should be shielded. The required cable connections are described in Table D.2 and Figures D.2 and D.3

Table D.2. *Minimal connections for RS-232 cable*

Signal Name	Pin Assignments		
	PC side		MSK240 side
	Sub-D 25 Female	Sub-D 9 Female	Sub-D 9 Male J5
Transmit Data	2	3	3
Receive Data	3	2	2
Signal ground	7	5	5

Note: All other signals on the MSK240 connector J5 are not connected.

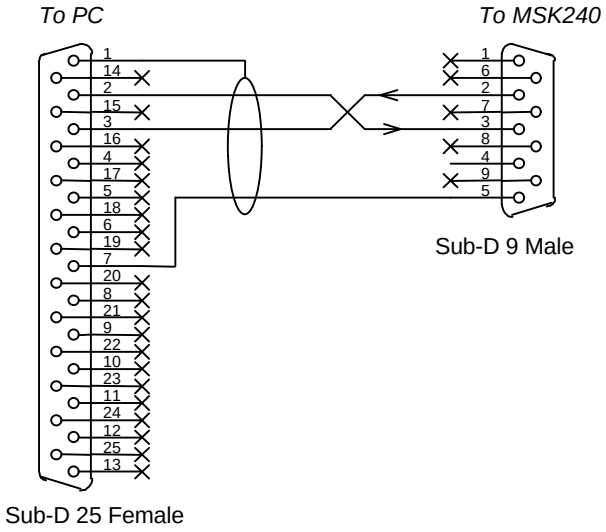


Figure D.2. ***Sub-D 9 to Sub-D 25 minimal cable***

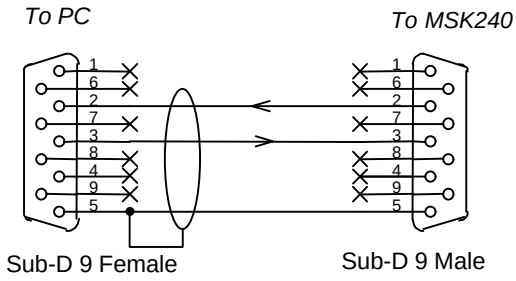
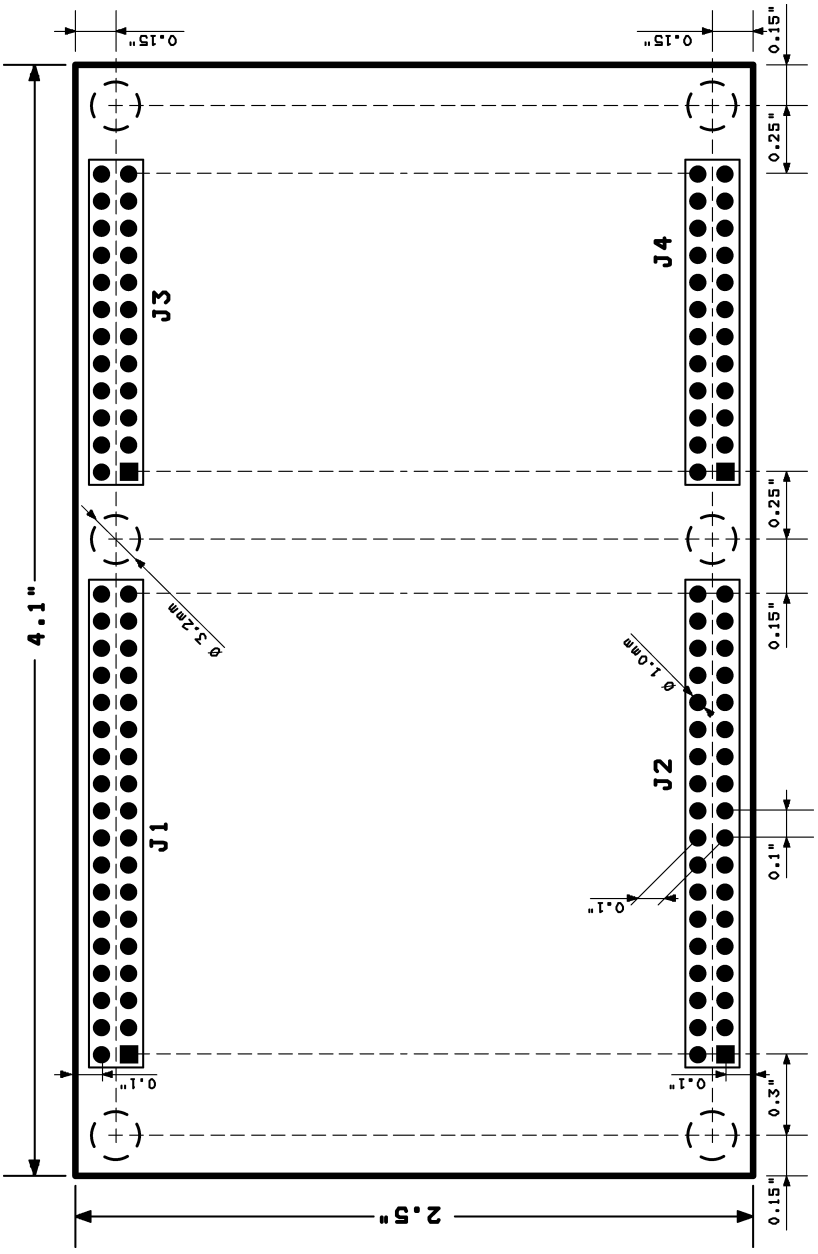


Figure D.3. ***Sub-D 9 to Sub-D 9 minimal cable***

Appendix E. Mechanical Dimensions - top view



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